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NOTES ON THE PREPARATION OF SOME FLUORESCENT AND PHOSPHORESCENT COMPOUNDS[1]

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ARTIFICIAL WILLEMITE OR ZINC ORTHOSILICATE, (Zn_2SiO_4)

Pure zinc orthosilicate has no luminescent properties but the addition of a minute amount of manganese causes it to show a bright green fluorescence when exposed to ultra violet light, cathode rays, or X-rays. Fluorescent natural willemite is found in the zinc mines of Franklin Furnace, N. J. and a few other places, but it is not a common mineral and it is also generally mixed with other earthy matters which tend to dull its luminescent properties. Both natural and artificial willemite often exhibit a more or less persistent phosphorescence after excitation.

A fine quality of artificial willemite may be prepared by pulverizing and mixing thoroughly:

C.P. zinc oxide	100 grams
C.P. silicic acid	50 grams
C.P. black oxide of manganese	0.5 "

This mixture which has a light gray color must be placed in a porcelain crucible and raised gradually to a temperature of about 1200°C. At about 800° to 1000°C. the powder changes from gray to light yellow and finally between 1100° and 1200°C. it becomes snow white, probably owing to the complete solid solution of the manganese. The changes in color from gray to yellow and then to pure white are gradual, depending upon the temperature and time, so that to insure an entire change thruout the mass, the crucible should be kept at a temperature between 1100° and 1200°C. for at least half an hour. If on cooling, the inside of the mass shows a yellow color, it should be ground up in a mortar and fired again until it shows a pure white thruout the mass on cooling.

[1] This series of directions for making artificial compounds showing luminescent properties more or less like those of natural minerals was obtained for this journal thru the interest of Mr. W. L. Lemcke, of Franklin, Pa.

To obtain the best results, all ingredients should be in a fine powder before mixing, so it is well to pass them thru a 200 mesh sieve. The crucible should be covered (altho luting is unnecessary) as the zinc oxide is otherwise liable to distill off before it combines with the silicic acid. When these precautions are observed and the firing is done properly, the resulting zinc silicate will have a bright green fluorescence under ultra violet light from the iron spark. It will also show a brilliant green color under the cathode rays, and will be more or less responsive to X-rays.

Different shades of green fluorescence from dark olive to light greenish yellow may be obtained by varying the amount of manganese content, and by applying different degrees of temperature. The above directions, however, produce a compound that shows a bright green fluorescence which resembles very closely that of the best natural willemite.

If it is desired for use as a paint it should be reground and the fine powder mixed to the proper consistency with a solution of one part, by weight, of gum arabic with twelve parts of water. It is best to make this solution fresh when wanted as it does not keep well.

Fluorescent Cadmium Phosphate

There are but few natural minerals that show a red fluorescence under ultra violet light. A variety of calcite that is found at Franklin Furnace, N. J. exhibits a light red or pink color under the iron spark but good specimens are rare.

It was therefore a welcome discovery to find that when a basic or neutral Cadmium phosphate, $Cd_3(PO_4)_2$, is fused with a small amount of manganese the resulting compound shows a brick red fluorescence under the iron spark, followed by a short period of phosphorescence of a darker red.

This compound may be prepared as follows:

Mix well 120 grams of finely pulverized neutral Cadmium phosphate, with 2 grams of black oxide of manganese, and heat to 900°-1000°C. in a porcelain crucible. The Cadmium phosphate will melt to a clear liquid which dissolves the manganese without showing any discoloration. Maintain in fusion for about 20 minutes and then pour out upon a clean slab of soap-stone or other suitable material. When cold, the mass will resemble white unglazed porcelain.

Under cathode rays the compound shows a bright golden orange fluorescence with a yellow phosphorescence for a short period. For use as a paint it may be ground very fine and mixed with a weak solution of gum arabic in water as already described.

Fluorescent and Phosphorescent Phosphate of Cadmium and Zinc

Mix well the finely pulverized material consisting of:

C.P. basic cadmium phosphate	60 grams
C.P. basic zinc phosphate	60 grams
C.P. black oxide of manganese	2 grams

Fuse the above mixture in a porcelain crucible at a full red heat and maintain in fusion for 15 or 20 minutes. Then pour out to cool on a clean slab of soapstone or porcelain. The fluorescence of this compound under the iron spark is a light pink, and its phosphorescence is a deep red resembling hot coals, and fairly persistent.

Cadmium Phosphate with a Pure White Fluorescence and Phosphorescence

It is well known that a white or nearly white luminescence can be obtained from a mixture of phosphorescent materials that produce respectively complementary colors, but in the present case it is a single pure salt of Cadmium that possesses the unique property of showing a clear white fluorescence and phosphorescence when exposed to ultra violet light from the iron spark.

This interesting compound may be made by fusing strictly C.P. basic Cadmium phosphate in a porcelain crucible, and pouring out the molten salt on a clean slab of soapstone or porcelain. When cold it is white and brittle like porcelain. It can be used as a paint by grinding fine and mixing with gum arabic or other suitable adhesive.

Fluorescent and Phosphorescent Anhydrous Cadmium Sulfate

To prepare this compound dissolve 100 parts by weight of C.P. cadmium sulfate in distilled water and add to it 0.2 parts of manganese sulfate or chloride, also dissolved in water. Stir the mixture well and evaporate to dryness. Then pulverize and calcine at a low red heat for about 30 minutes. When cold, pulverize again and sift. Keep in a well stoppered glass bottle.

Care must be taken in calcining the above not to raise the temperature too high, for at a bright red heat it decomposes and becomes worthless. When properly prepared, it shows a pink fluorescence under the iron spark and a bright yellow phosphorescence which is fairly persistent.

Under cathode rays it shows a bright yellow fluorescence and phosphorescence, but X-rays produce no luminescence. If kept in the open it gradually absorbs moisture, and loses its property of fluorescence which, however, can be restored by calcination.

Fluorescent and Phosphorescent Anhydrous Zinc Sulfate

This compound can be prepared by the same process as that described for making fluorescent cadmium sulfate by substituting the zinc salt for the cadmium. It shows a pink fluorescence under the iron spark and a fairly persistent dark red phosphorescence, giving it the appearance of red hot coals.

Under cathode rays in a vacuum tube the fluorescence and phosphorescence are bright red. Like the anhydrous cadmium sulfate it is not responsive to X-rays.

If exposed to air it absorbs moisture quickly and loses its property of fluorescence, so it must be kept in a well stoppered bottle. However, fluorescence can be restored by recalcination.

Preparation of Fluorescent Uranyl Fluoride

Dissolve 50 grams of uranyl nitrate in 200 C.C. distilled water. In another vessel (which must be protected on the inside with a coating of paraffin or beeswax), dissolve 75 grams of ammonium fluoride in 110 C.C. of distilled water. On mixing these two solutions, a precipitate of uranyl fluoride will be formed, which will settle within a few minutes, and the clear liquid containing ammonium nitrate can then be poured off, draining the precipitate as dry as possible. The precipitate is fairly soluble in cold water and very soluble in hot water, so that if it is necessary to remove the small amount of ammonium nitrate left in the damp precipitate after draining, the washing should be done very carefully with cold water. The precipitate can be completely dried by pouring it out on filter paper and allowing it to stand for a few hours in a warm place. The exact formula for this compound is rather uncertain as it may be a double salt of uranium and ammonium. It is brightly fluorescent under the ultra violet rays from an iron spark

but the period of its phosphorescence is too short to be seen by the unaided eye. It is also weakly responsive to excitation by the X-rays.

Tribo-Luminescent Zinc Sulfide

This interesting compound may be prepared as follows:

Zinc carbonate or oxide	100 grams
Flowers of sulfur	30 grams
Black oxide of manganese	0.5 grams

The above ingredients must be in a fine powder and intimately mixed. Place the mixture in a porcelain crucible and calcine at a full red heat for about 30 minutes, or until the mixture assumes a light yellow color thruout when cold.

If a pinch of the above is put on a piece of card and rubbed with the blade of a knife, a stream of yellow scintillations will be produced. It shows no fluorescence or phosphorescence under the ultra violet rays from the iron spark, but cathode rays produce a brilliant yellow fluorescence without any perceptible afterglow. It also shows a yellow fluorescence under X-rays, without noticeable phosphorescence.

EAKLEITE FROM ISLE ROYALE, MICHIGAN[1]

William F. Foshag and Esper S. Larsen, *Washington, D. C.*

A specimen labeled "Wollastonite, Isle Royale, Mich." in the United States National Museum was recently noticed to have the general appearance of the eakleite from the original locality at St. Inez, California, and further study has confirmed the suspicion that the mineral actually is eakleite.

The specimen consists of an aggregation of radiating fibers, with a somewhat silky luster and a pale pink color. The material is exceedingly tough. Microscopic examination showed that it is made up mostly of eakleite, with properties similar to those of the mineral from California. The Isle Royale mineral is finer fibered and is less pure, as it contains several per cent of a weakly birefracting material that is probably a sort of serpentine or chlorite. This foreign material forms nests of small grains in the fibrous masses. The optical properties of this eakleite, compared with those of the original material from California, are:

[1] Published with the permission of the Secretary of the Smithsonian Institution and the Director of the United States Geological Survey.

Locality	*Isle Royale*	*St. Inez*
α	1.579 ± 0.005	1.583
β		1.583
γ	1.590 ± 0.005	1.593
Extinction	Z||elongation	Z||elongation
Optical character	+	+
Axial angle	Small	Very small

The material for analysis was not entirely free from the chloritic admixture, but was of sufficient purity to indicate the nature of the mineral. The analysis, made by standard methods, is given below, together with the analysis of the original material from California, for comparison.

Locality	*Isle Royale*	*St. Inez*
SiO_2	50.88	50.17
Fe_2O_3	1.32	1.04
CaO	42.88	45.45
MgO	1.10	tr.
Na_2O	0.55	none
$H_2O(-)$	0.12	
$H_2O(+)$	3.68	3.18
	100.53	99.84

The optical properties distinguish this mineral from wollastonite and indicate that it is actually eakleite, and the chemical analyses of the two occurrences are sufficiently close, to definitely confirm its assignment to that species. The great toughness of the eakleite from both localities is noteworthy. Dana gives as a locality for wollastonite the Cliff Mine, Keweenaw Point, and Isle Royale, Michigan, and describes the mineral as a very tough variety, having a red color. It seems evident that what is referred to is the eakleite described above. Dana notes the locality to be exhausted, but specimens will probably be found among the wollastonites in old collections.

AN APPARATUS FOR HANDLING DELIQUESCENT CRYSTALS

CHESTER B. SLAWSON, *University of Michigan*

When measuring deliquescent crystals one is often forced to work in an atmosphere free from moisture for a considerable length of time. The following is a description of a moisture free chamber which has been used successfully in this laboratory. It consists of a galvanized iron box, Fig. 1, 40 cm. long, 30 cm. wide, and 24 cm. deep with glass windows in the top and front. The cover C, Fig. 2, fits down into the groove B, in the bottom of which is a piece of rubber tubing and when forced down by the pressure of the clamps as shown in Fig. 1, it makes an airtight connection. In each end of the box are holes 12 cm. in diameter thru which the arms are inserted. Rubber sleeves 30 cm. in length and 8 cm. in diameter at the smaller end are here attached.

Calcium chloride or phosphorus pentoxide may be used to absorb the moisture in the chamber. Before using the chamber, the rubber sleeves are tied with a cord close up to the side of the chamber. Then thin rubber gloves are drawn over the hands which are then inserted into the free ends of the sleeves. After fastening the sleeves tightly about the wrists, the cords are removed and the hands and forearms are inserted into the chamber. To take care of the differential pressures that are developed when the hands are moved in and out of the chamber, a calcium chloride tube is attached at a small opening not shown in the figure.

Working in the chamber, the crystal to be measured is mounted in the apparatus manufactured by Fuess for use in this type of work. It consists of a glass container, Fig. 3, with plane glass windows (b) which rests upon a hard rubber hemisphere (c). Calcium chloride is placed in the depression (d). The small pedestal (*a*) upon which the crystal is mounted is movable and permits the preliminary adjustments of the crystal to be made from beneath and the finer adjustments are then made in the usual manner. After the crystal has been mounted in the glass container, the container is removed from the chamber and mounted upon the goniometer. Tutton[1] has not found the glass container entirely satisfactory but by remounting the crystal in the moisture free chamber we were able to measure four or five zones before the faces began to lose their brilliancy.

[1] Tutton, *Crystallography and Practical Crystal Measurement*, p. 497.

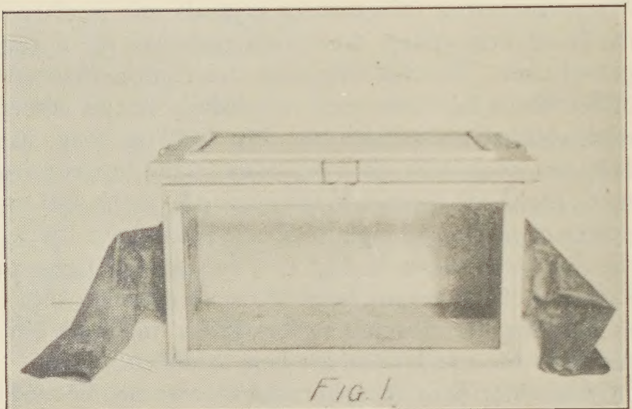

FIG. 1

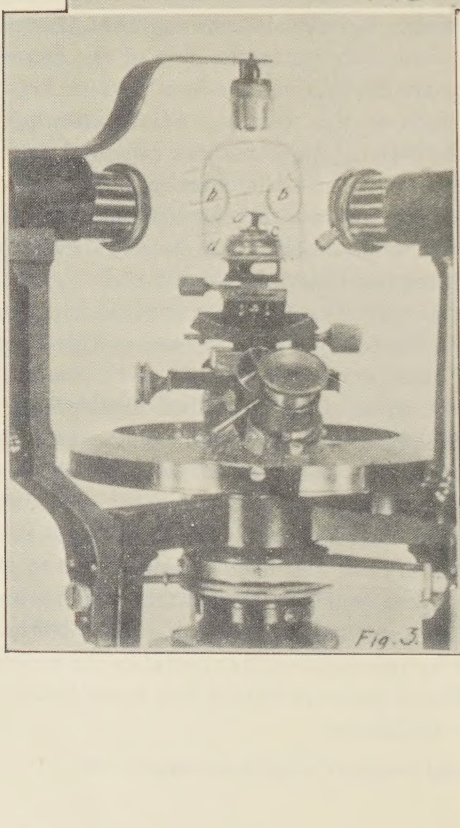

Fig. 3.

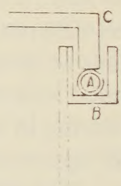

FIG 2

CRYSTALLOGRAPHY OF THREE MINERALS FROM RHODE ISLAND[1]

ALFRED C. HAWKINS, *Rochester, New York*

The minerals here described are all from localities not previously mentioned in the literature. They were collected while the writer was teaching at Brown University in 1915-16. The apatite was measured on the two-circle goniometer at Harvard University, and thanks are herewith extended to Professor Palache for his assistance in working out this crystal. The aid of Dr. Edgar T. Wherry in the calculation and drawing of the epidote and hematite is also gratefully acknowledged.

HEMATITE FROM MANTON

The crystals studied were found in 1916 in a quarry at Manton, near Providence. This quarry is worked for road material, and is located in "green schist," a hornblende rock representing an ancient basic igneous mass of gabbroid composition. The hematite is associated with orthoclase, epidote, excellent foliated green talc, and calcite. It has probably been formed by the action of a nearby granite intrusion during the formation of original silicate minerals, the alteration of which has afforded some of the above mentioned associates. The single reasonably complete crystal, 2 mm. in diameter, is here described and figured. (Figs. 1 and 2.)

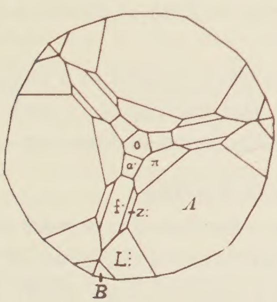

FIG. 1. TOP VIEW

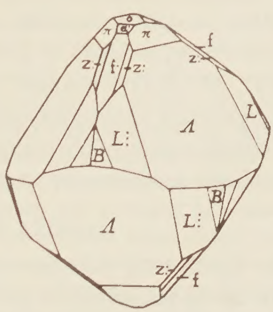

FIG. 2. FRONT VIEW

[1] Presented at the Amherst meeting of the Mineralogical Society of America, December 29, 1921.

Table 1. Angles of Hematite from Manton, R. I.

Letter	Symbols: Gdt.	Symbols: Brav.	Angles: Measured ϕ	Measured ρ	Angles: Calculated ϕ	Calculated ρ
o	0	0001		0°00′		0°00′
π	10	$10\bar{1}1$	0°23′	42 10	0°00′	42 14
*Λ	$\frac{16}{9}$ 0	$16.0.\overline{16}\,9$	0 02	58 07	"	58 14
a˙	$-\frac{1}{5}$	$\bar{1}\bar{1}25$	30 32	17 30	30 00	17 28
f˙ δ˙	$\pm\frac{1}{2}$	$11\bar{2}2$	"	38 12	"	38 11
*B˙	$\frac{10}{9}$	$10.10.\overline{20}.9$	30 14	60 13	"	60 13
z:	$-\frac{4}{5}\ \frac{1}{5}$	$\bar{4}155$	11 05	40 14	10 53	39 46
L⁝	$\frac{4}{3}\ \frac{2}{3}$	$42\bar{6}3$	19 29	59 05	19 06	58 01

Two new forms which prove to be present are designated by an asterisk. The faces of *o* and π are plane and bright, as also are f˙ and z:; a˙ is stepped and repeated at intervals along f˙; Λ is marked with a few deep striations parallel to rhombohedron f˙; similar lines show on L⁝ and B˙ which are otherwise bright and prominent forms.

Epidote from Pascoag

The epidote crystals from this new locality are 1 to 5 centimeters in length, and are very dark green in color, with sharp angles and plane faces except for a few of the domes which are striated. They are highly complicated, and all of the forms here listed occurred on one crystal.

c (001), t (100), u (210), z (110), k (012), o (011), e (101), R ($\bar{1}$03), i ($\bar{1}$02), σ ($\bar{2}$03), r ($\bar{1}$01), a ($\bar{2}$01), f ($\bar{3}$01), d (111), ϑ (121), n ($\bar{1}$11), M ($\bar{2}$11); twinned on c.

The crystals occur embedded in the white quartz of a pegmatite vein which cuts a gabbro exposed in a glaciated knob of rock in the fields about a kilometer northwest of the town of Pascoag.

Apatite from South Foster

The apatite crystals here described were found in a road cutting at the white schoolhouse on the hill just west of the town of South Foster. They are developed along a contact line where a fine grained granite dike lies against a small mass of white crystalline limestone; they occur in small open cavities associated with crystallized biotite and scapolite. They are white and translucent, with so-called alpine habit, and are greatly distorted. The table

given below, obtained by measurement of a crystal slightly more than one millimeter in diameter, shows what seems to be a new form for the species. This is represented by two fairly prominent faces, which gave, however, only fair signals on the goniometer. It is indicated by an * in the table.

Table 2. Angles of Apatite from South Foster

Letter	Symbol		Angles			
	Gdt.	Brav.	Measured		Calculated	
			ϕ	ρ	ϕ	ρ
c	0	0011		0°00′		0°00′
a	∞ 0	$10\bar{1}0$	0° 00′	90 07	0° 00′	90 00
r	$\frac{1}{2}0$	$10\bar{1}2$	"	23 09	"	22 57
x	10	$10\bar{1}1$	"	40 39	"	40 16
y	20	$20\bar{2}1$	"	59 34	"	59 27
z	30	$30\bar{3}1$	"	67 26	"	68 31
s	1	$11\bar{2}1$	30 00	55 58	30 00	55 43
*	6	$6.6.\overline{12}.1$	"	83 49	"	83 31

BOOK REVIEWS

ELEMENTE DER PHYSIKALISCHEN UND CHEMISCHEN KRYSTALLOGRAPHIE, P. Groth. 8-vo. x+363 pages, with 962 text figures, 4 plates, and 25 stereoscopic photographs. R. Oldenbourg, Munich, 1921.

When Professor Groth first delivered a course of lectures at the School of Mines in Berlin in 1870 in which he discussed crystallography from the standpoint of the physical relationships, he departed materially from the then conventional method of presenting the subject. These lectures were subsequently repeated at the University of Strassburg and eventually led to the publication of his "Physikalische Krystallographie" in 1872, which has since passed thru several editions; the last of them, the fourth, appeared in 1905. Also, as is well known, he has just completed his "Chemische Krystallographie," a monumental work of 5 volumes, which is a critical survey of our knowledge of crystallized substances. In fact, Professor Groth has devoted the major portion of his very active life to problems in chemical and physical crystallography and hence is exceptionally well equipped to present in a single volume the salient facts concerning the intimate relationships existing between the chemical constitution and the various physical properties of crystals. Accordingly the present text attempts to give the student of chemistry and physics a knowledge of the fundamentals of crystallography without burdening him with a mass of information about minerals, for usually crystallography is presented only in connection with mineralogy.

The book is divided into two parts: (a) Physical Crystallography, and (b) Chemical Crystallography. The first part is sub-divided into two sections designated as General and Special, respectively. There is also an Appendix which is

to serve as an introduction to the Determination of Crystals. Ninety-seven pages are devoted to the General section on Crystallography. This section includes an introduction and chapters dealing with the physical properties, structure, and geometrical relationships of crystals. The style follows very closely that of Professor Groth's Physikalische Krystallographie. The illustrations have apparently been also taken from that text. Less than four pages are devoted to the discussion of the determination of crystal structure by means of X-rays. The Special section contains 170 pages and is a systematic discussion of the 32 classes of symmetry, with numerous examples of substances belonging to the various classes. This material has been carefully selected from that given in the author's Chemische Krystallographie.

The section on Chemical Crystallography occupies 57 pages and includes the following chapters: Chemical and Crystallographic Symmetry, Crystal-chemical Relationship (Morphotropy, Isomorphism), and Polymorphism. This portion of the text should prove of the utmost interest to the student of chemistry. The appendix of 14 pages contains an introduction and short sections dealing with the microscope, refractometer, conoscope, and goniometer. The treatment of these instruments is very elementary. Unfortunately the two-circle goniometer is not discussed, due probably to the fact that practically all of our information concerning the crystallography of chemical substances is in terms of the one-circle method.

EDWARD H. KRAUS

ANLEITUNG ZUM BESTIMMEN DER MINERALIEN, FUCHS-BRAUNS. Seventh Edition, 223 pages, with 27 illustrations in the text. Alfred Toepelmann, Giessen, 1921.

This edition of these popular mineral tables follows very closely the others. Errors have been corrected, possible substitutes for platinum in blowpipe methods are discussed, and Naumann symbols are replaced by Miller indices.

The book consists of five parts. In part one, to which 23 pages are devoted, descriptions of important blowpipe reactions are given. Tables for the determination of minerals by blowpipe methods make up part two, consisting of 34 pages. Useful microchemical methods and tests are fully described in the next 41 pages, designated as part three. For the recognition of minerals by means of their physical properties, reinforced by simple blowpipe and other chemical tests, there are excellent tables in part four. These tables include 107 pages. In the 9 pages making up part 5 are found the values of the characterizing angles of some of the more common minerals.

The book is an excellent compendium of information relating to the determination of minerals by their physical and chemical properties. E. H. K.

MINERALOGISCHE TABELLEN, P. GROTH AND K. MIELEITNER. 176 pages. R. Oldenbourg, Munich, 1921.

This is essentially a revision in a somewhat condensed form of the senior author's "*Tabellarische Uebersicht der Mineralien, nach ihren kristallographisch-chemischen Beziehungen geordnet*," the last edition of which appeared in 1898. There has, however, been added a second part containing tables for the determination of the more important minerals by means of their external physical properties.

The fundamental chemical principles which are followed in making this very logical classification of minerals are briefly discussed in an introduction of 11 pages.

Those minerals now commonly recognized as independent species are then arranged in isomorphous series, as far as possible, under the following general headings: elements (3 pages), sulphides and sulpho-salts (15 pages), oxygen compounds (6 pages), haloids (5 pages), nitrates, carbonates, and related minerals (7 pages), sulphates and related compounds (11 pages), borates, aluminates, and so forth (4 pages), phosphates and allied compounds (18 pages), silicates, titanates, and so forth (46 pages), and organic compounds (2 pages). There is also a list, extending over 5 pages, of minerals, which are now interpreted as mechanical mixtures, or which have not been sufficiently investigated to permit them to be accurately classified. Each series of minerals is accompanied by a concise, critical discussion of the relationship of the minerals in the series, and in addition to the chemical data, the elements of crystallization are given, whenever available.

This classification of minerals deserves to be more widely known in America, for it has many admirable features to commend it, among which is the passing progressively from the simplest, the elements, to the most complex minerals, the silicates and organic compounds.

In the determinative tables the more common minerals are grouped according to hardness and streak. Other properties made use of are color, luster, crystallization, cleavage, structure, occurrence, and associates.

E. H. K.

PROCEEDINGS OF SOCIETIES

NEW YORK MINERALOGICAL CLUB

November 30, 1921

The regular monthly meeting of the New York Mineralogical Club was held in the American Museum of Natural History on the evening of Wednesday, November 30, at 8:15 P.M. There were present 22 members. During the temporary absence of the President, the Vice President presided.

The matter of identification of the Club members at field meetings was introduced by Mr. Tansley who moved that the members on such occasions provide themselves with a white ribbon to be worn conspicuously and that the Secretary remind the members of this by inserting a note in the field meeting announcements. The Secretary called attention to the advisability of printing a list of the members of the Club for the convenience of responsible parties requiring such information. A motion to print such a list was carried. The President then introduced the speaker of the evening, Professor Charles Palache of Harvard University who read a paper on "*The minerals of Franklin Furnace.*"

The speaker, who had begun the study of this deposit in 1896, called attention to the results of his investigations as published in the Franklin Furnace Folio in 1908. Reading from a manuscript soon to be printed, he took up briefly the history of the deposits, mentioning the description of zincite by Bruce in 1810, and tracing the history back to the Dutch period in 1640, and to the shipping of ore by Lord Sterling early in the 17th Century. He drew attention to the fact that McClure sent franklinite abroad for identification, and to the work of Dr. Fowler and his son in interesting geologists in the scientific possibilities of the deposits. He spoke of the scientific interest displayed by Mitchell, Torry and particularly Alger and of the first successful exploitation by the New Jersey Zinc Co. in 1850.

In calling attention to some of the important collections he cited those of Canfield, Hancock and Loesie and mentioned the service to science of Lazard Cahn as a distributor of unique Franklin minerals.

The talk was followed by a discussion of the various species, illustrated in many instances by original and unpublished drawings of the crystal forms.

Briefly discussing the origin of the deposits the speaker first took up the older theory of a strictly igneous origin, following which he spoke of Nason's theory of a purely metamorphic genesis and the third suggestion that the ore bodies were contact deposits. The speaker next advanced his own theory that they represented replacement deposits produced by the permeation of the Precambrian limestone by solutions similar to those which produced the surface deposits of Sterling Hill, but here depositing anhydrous minerals. At the close of Professor Palache's paper, his last statement was discussed by Professor Finlay.

On a motion by Mr. Ashby, a vote of thanks was tendered to the speaker for his highly interesting and valuable paper.

HERBERT P. WHITLOCK, *Recording Secretary*

THE PHILADELPHIA MINERALOGICAL SOCIETY

Academy of Natural Sciences, December 8, 1921

A stated meeting of the Philadelphia Mineralogical Society was held on the above date with the president, Mr. Trudell, in the chair. Nineteen members were present.

The following proposals for membership were made: Messrs. Frank J. Keeley, Arthur Low, and Walter Lapp.

Mr. Frederick Oldach presented a paper, illustrated with specimens, on "The Mineralogy of Brinton's Quarry," in which the origin and occurrences of the various minerals were discussed. Mr. Vaux called attention to a sepiolite locality where the Newton Square R.R. crosses Bryn Mawr Ave.

Messrs. Frankenfield and Boyle described the society's excursion on November 14 to Brinton's quarry, attended by Messrs. Boyle, Chalfont, Frankenfield, Jones, Knabe, Oldach, and Trudell. Clinochlore and colerainite (?) were found.

The secretary called attention to the exhibition case in the rear of the hall containing some new accessions, including a series of specimens from Sweden, Japan, Peru, Bolivia, and Chile, among them very fine tetrahedrites from Peru, remarkably translucent cassiterite crystals from Bolivia, and wavellite in crystals measuring 5×3 mm. from Bolivia.

SAMUEL G. GORDON, *Secretary*

NOTES AND NEWS

THE STATEMENT OF THEORETICAL COMPOSITIONS OF MINERALS.—In his *System of Mineralogy*, Dana stated the theoretical percentage compositions of minerals only to the first decimal place; but every now and then a mineral analyst, affecting greater precision, will state them to the second or even to the third place. The number of decimal places which can be correctly used is of course determined by that to which the atomic weights of the elements concerned is known, so the latter procedure implies that these values are established with great certainty. While this may be true of a few elements, as for instance bromine, chlorine, hydrogen, potassium, silver, and sodium,—modern precise work is con-

tinually leading to changes in long accepted values for other elements, as is illustrated by recent papers on aluminium[1] and on antimony.[2] The effects of these changes on the theoretical compositions of simple minerals are brought out in the following tabulations:

SILLIMANITE		
At. wts. of Al	27.10	26.96
Per cent. Al_2O_3	62.89	62.83
Per cent. SiO_2	37.11	37.17
	100.00	100.00

STIBNITE		
At. wts. of Sb	120.20	121.77
Per cent. Sb	71.42	71.68
Per cent. S	28.58	28.32
	100.00	100.00

It is plain that Dana's judgment was sound, for such changes in atomic weights affect even the first decimal place, so that the second, and even more the third, are quite meaningless. Only when the atomic weights of all the elements concerned in a mineral become known with greater finality than many of them are at present, will extension of the theoretical compositions beyond one decimal be justified.

E. T. W.

A real event in the mineralogical world has been the recent publication by the U. S. Geological Survey of *Bulletin 697*, "The microscopic determination of the nonopaque minerals," by Esper S. Larsen. We hope to have an extended review of this in an early number, but meanwhile advise every student of mineralogy to send for a copy to the Superintendent of Documents, Washington, D. C., the price being 30 cents (stamps not accepted).

We regret to note the death of Professor Albert Beutell, of the Technical School of Breslau, Germany, well known for his studies on the compositions of minerals, notably the cobalt-nickel arsenides and the zeolites.

On invitation of the Departments of Mineralogy and Geology of the University of Michigan, the next annual meeting of the Mineralogical Society of America will be held at Ann Arbor, Michigan, December 28 to 30, in conjunction with that of the Geological Society of America and other affiliated societies.

All petrographers will regret to hear of the death of Dr. Ernst Weinschenk, Professor of Petrography in the University of Munich. Dr. Weinschenk was the author of a number of books, three of which have been translated into English; Anleitung zum Gebrauch des Polarisationsmikroskops, Die Gesteinbildenden Mineralien, and the first volume of Grundzüge der Gesteinskunde.

ABSTRACTS—CRYSTALLOGRAPHY

A GROUPING OF THE THIRTY TWO CRYSTAL CLASSES. HERMANN TERTSCH, *Centr. Min. Geol.* **1916**, 145-154, 171-180.

The 32 crystal classes are grouped in 7 "grades" according to the symmetry of the crystal. The first two classes are made up of those crystals possessing only a polar or an alternating axis, respectively; the five other grades are derived by combining these with other symmetry operations. EDW. F. HOLDEN

[1] Richards and Krepelka, *J. Am. Chem. Soc.*, 42, 2221-2232, Nov., 1920.

[2] Willard and McAlpine, *J. Am. Chem. Soc.*, 43, 797-818, April, 1921.

THE SYMMETRY OF ROENTGEN DIAGRAMS OF TRIGONAL AND HEXAGONAL CRYSTALS; AND NORMAL AND ABNORMAL DIFFRACTION IMAGES OF DOUBLY REFRACTING CRYSTALS. H. Haga and F. M. Jaeger. *Versl. Akad. Wet. Amsterdam*, **24**, 443-459, 1916. 2. THE SYMMETRY OF ROENTGEN DIAGRAMS OF ORTHORHOMBIC CRYSTALS, *ibid.* 460-473. 3. OF MONOCLINIC CRYSTALS, *ibid.* 1135-1139. 4. OF TETRAGONAL CRYSTALS, *ibid.* 1403-1409. 5. OF ISOMORPHOUS CRYSTALS, *ibid.* 1410-1415. 6. THE SYMMETRY OF ROENTGEN DIAGRAMS OF TRICLINIC AND SEVERAL ORTHORHOMBIC CRYSTALS; AND NOTES ON THE DIFFRACTION IMAGES OF QUARTZ, *ibid.* 1612-1617; thru *Neues Jahrb. Min. Geol.*, **1918**, Ref. 239-242.

An investigation of several artificial compounds and the following minerals: tourmaline, phenacite, dolomite, calcite, apatite, quartz, nephelite, penninite, anhydrite, aragonite, topaz, struvite, calamine, scolecite, gypsum, epidote, hornblende, augite, rutile, cassiterite, scheelite, wulfenite, strontianite, witherite, and cerussite. E. F. H.

A SURVEY OF THE THEORIES OF ALLOTROPY. J. W. Terwen. *Z. phys. Chem.* **91**, 443-468, 1916; thru *Neues Jahrb. Min. Geol.* **1918**, Ref. 253.

The Smits theory of allotropy, especially, is discussed. Many examples of allotropic modifications are cited to support it. This theory is that the allotropic modifications of a substance are mixed crystals of different compositions, in which two or more kinds of molecules are present in varying proportions. E. F. H.

THE HABITS OF CALCITE FROM THE POLISH FORMATIONS. St. Kreutz. *Bull. Acad. sciences Cracovie* **1916**, 172-189; thru *Neues Jahrb. Min. Geol.* **1919**, Ref. 34-38.

This paper describes in detail calcite crystals from many Polish localities. These occur in formations from the Devonian to Eocene. No new forms are described. E. F. H.

SULFUR AND BARITE FROM SWOSZOWICE. St. Kreutz. *Bull. acad. sciences Cracovie. Cl. sc. math. et nat. Ser. A; Sc. math.* **1916**, 60-74; thru *Neues Jahrb. Min. Geol.* **1918**, Ref. 130-132.

Sulfur crystals occurring with barite in beds in the Miocene at Swoszowice showed distinct natural etch figures, especially on p. (111) and n (011), but the symmetry was not clearly indicated. E. F. H.

THE PRESENTATION OF CRYSTALLOGRAPHY AND ITS EMPLOYMENT IN GEOMETRIC INSTRUCTION. Julius Ruska. *Natur. Naturw. Erdkunde Unterricht*, **1916**, 449-461, 512-522, 564-575, 617-628; thru *Neues Jahrb. Min. Geol.* **1918**, Ref. 239.

The author's experience, in the use of crystallography in relation to the teaching of geometry, is described. E. F. H.

THE HEAPING-UP METHOD. E. A. Wülfing. *Sitzb. Heildelberg Akad. Wiss., Math.-naturw. Kl.*, (1) **11**, 28p. **1916**; thru *Neues Jahrb. Min. Geol.* **1918**, Ref. 109.

The author holds that to obtain true values for the angles between crystal faces a great number of crystals must be measured, and an average value found.

E. F. H.

NOTEWORTHY MINERALS, AND A NEW METHOD OF SPECIFIC GRAVITY DETERMINATION. Julius Ruska. *Unterrichtsbl. Math. Naturw.*, **1916**, no. 5; thru *Neues Jahrb. Min. Geol.* **1918**, Ref. 237-238.

The author has obtained impossible forms and axial ratios for certain selected minerals, by perverting propositions in trigonometry and stereometry. In a similar way he has calculated the sp. gr. of sulfur to be 3. E. F. H.

THE SYMMETRY OF CRYSTAL ROENTGEN DIAGRAMS. M. v. Laue. *Ann. Phys.* **50**, 433-446, 1916; thru *Neues Jahrb. Min. Geol.* **1918**, Ref. 111-112.

If the direction of the Roentgen ray incident on a crystal face be reversed, the direction of the refracted ray is similarly reversed; so that the figures obtained for the two directions must be congruent. The relation of this to symmetry in the crystal face is discussed. E. F. H.

THE DISTURBANCE OF THE STRUCTURE OF HOMOGENEOUS LIQUID CRYSTALS BY TWISTING. O. Lehmann. *Ann. Physik.* (4) **51**, 353–390, 1916; thru *Neues Jahrb. Min. Geol.* **1918**, Ref. 254.

Twisting the solid while plastic affects the character of the resulting anisotropic liquid. E. F. H.

CRYSTALLIZATION STRENGTH AND LINEAR FORCE OF GROWING CRYSTALS. Franz E. Suess. *Naturwissenschaft. Wochenschrift*, **15**, 697-701, 1916; thru *Neues Jahrb. Min. Geol.* **1918**, Ref. 238.

A summary of what is known on the subject. E. F. H.

AN ELECTROLYTE WITH COLLOIDAL AND CRYSTALLINE PHASES. Håkan Sandqvist. *Koll. Z.* **19**, 113-121, 1916; thru *Neues Jahrb. Min. Geol.* **1918**, Ref. 253-254.

Solutions of bromphenanthren in sulfuric acid afford liquids having both isotropic and anisotropic phases. By mixing them with water, liquid crystals of all grades of viscosity up to viscous crystals were obtained by O. Lehmann.

E. F. H.

LIQUID CRYSTALS AND ANISOTROPIC LIQUIDS. W. Voigt. *Phys. Z.* **17**, 76-87, 128-135, 152-161, 305-307, 1916; thru *Neues Jahrb. Min. Geol.* **1918**, Ref. 2.

A theory of liquid crystals is proposed. E. F. H.

THE OILY STREAKS IN LIQUID CRYSTALS. O. Lehmann. *Phys. Z.* 17, 241-251, 1916; thru *Neues Jahrb. Min. Geol.* **1918**, Ref. 3-4.

The "oily streaks" are caused by an unusual twinned arrangement of the molecules of the liquid crystal. E. F. H.

ANGLESITE FROM THE TINTIC DISTRICT, UTAH. E. H. Kraus and A. B. Peck. *Neues Jahrb. Mineral. Geol.* **1916**, II, 17-30.

Anglesite occurs on quartz crystals in cavities in a siliceous rock which contains galenite. Sp. gr. = 6.350. The crystals are of four types; (1) prismatic, (2) pyramidal, (3) tabular, and (4) domatic. Two new forms λ (210) and Δ (441) were observed, as well as the doubtful forms *R* (12.13.156) and (450), which would be new for this locality. E. F. H.

DIASPORE FROM THE SIEBENGEBIRGE AND THE ISLAND OF NAXOS. Maria Waterkamp. *Centr. Min. Geol.*, **1916**, 522–525.

Diaspore occurs in transparent yellow crystals at Königswinter in the Siebengebirge in inclusions in a trachyte. They are tabular parallel to (100) and show

three new forms; α (706), β (796), and χ (201). Diaspore from the island of Naxos, probably an alteration product of corundum, occurs in bright transparent crystals which showed the new forms *d* (140), ϕ (350), *g* (27.2.11) and *i* (502). E. F. H.

STRENGITE FROM KIIRUNAVAARA—A FURTHER NOTE—AND DIASPORE FROM GELLIVAARA. R. Köchlin, *Min. petr. Mitt.* **34**, **1916**; thru *Neues Jahrb. Min. Geol.* **1917**, Ref. 283.

Strengite crystals, sp. gr. 2.86, colorless and transparent, show *a* (100), *p* (111), and less often *d*(120). Two undetermined hydrous iron phosphates are noted, one of which, occurring in transparent red-violet crystals, sp. gr. 2.726, may be vilateite. Asparagus green diaspore, sp. gr. 3.408, is found in hematite at Gellivaara. E. F. H.

ABSTRACTS—MINERALOGY

THE DETERMINATION OF THE SPECIFIC GRAVITY OF MELTED SALTS AND THE TEMPERATURE COEFFICIENTS OF THEIR MOLECULAR SURFACE ENERGIES. F. M. Jaeger and J. Kahn. *Versl. Akad. Wet. Amsterdam* **25**, 284-300, 1916; thru *Neues Jahrb. Min. Geol.* **1918**, Ref. 118-119.

A hydrostatic method of determining the specific gravity of melts at high temperatures is described. A platinum weight is immersed in the fusion. E. F. H.

THE EQUAL IMPORTANCE OF TIO_2 AND CO_2, AS WELL AS SiO_2 AND CO_2, IN ALKALI-, CALC-ALKALI, AND ALKALI-ALUMINATE MELTS. P. Niggli. *Z. anorg. allg. Chem.* **98**, 241–326, 1916; thru *Neues Jahrb. Min. Geol.* **1918**, Ref. 123–125.

The close relations between carbonates and titanates, as well as between silicates and carbonates, in compounds with the alkalies and alkali-aluminates, are given in this paper. E. F. H.

THE CARBONATES, II. Hans Leitmeier. *Neues Jahrb. Min. Geol., Beil. Bd.* **40**, 655-700, 1916.

The genesis of the carbonates of calcium, magnesium, and calcium and magnesium, is discussed. Aragonite is not distinguished from calcite by a small content of hydroxyl, as W. Vaube suggested. Lansfordite from the mineral water at Rohitsch Sauerbrunn in Steiermark showed the indices; $\alpha = 1.4559$, $\beta = 1.4755$, $\gamma = 1.5023$. Results of experiments on the solubility of magnesite and dolomite in carbonated waters are given. E. F. H.

SIMPLE GLIDING IN HAUSMANNITE AND ITS OPTICAL CHARACTERS. O. Mügge. *Centr. Min. Geol.* **1916**, 73-78.

Hausmannite from five localities showed twinning lamellae parallel to (101), and crystals from Öhrenstock exhibited gliding phenomena. Sections parallel to (001) show it to be uniaxial, with strong birefringence and brownish red color. E. F. H.

MAGNETIC PROPERTIES OF HEMATITE. T. T. Smith. *Phys. Rev.*, **8**, 721-737, 1916.

An investigation of hematite from several localities shows that it possesses a magnetic symmetry axis, magnetism being equally strong in all directions perpendicular to the axis, and much weaker in that of the axis. E. F. H.